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Prevalence of Soil Transmitted Helminths and Associate Transmission Factors among School Children in a Selected Barangay in Trece Martires City, Cavite

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ABSTRACT:
Soil-transmitted helminthes (STH) affect more than 2 billion people worldwide while the cumulative prevalence of STH infection among elementary school children in the Philippines was 67%. This study aimed to assess the presence of soil transmitted helminthes among school children and determine its association with the family's demographic profile (parents' highest educational attainment, children's age and sex) and transmission factors (family size, house flooring, water sources, presence of latrine, hand washing habit and shoe-wearing habits). The study utilized descriptive-cross sectional design and total population sampling. Subjects were children aged 3 to 8 years old. Demographic data and risk for transmission factors were obtained using a questionnaire while stool samples from 108 children were collected and tested for presence of STH using kato-thick technique. The data gathered were analyzed using frequency, percentage, and multiple logistic regression. A total of 108 children were screened for STH infection and 32 (29.62%) of them were positive for Ascaris lumbricoides, 8 (7.40%) were positive for Trichuris trichuria and 20 18.51%) were positive for hookworm. The educational attainment of the parents has a significant effect in the presence of STH infection.
Key words: *Ascaris lumbricoides, Trichuris trichiura*, Hookworm, Soil Transmitted Helminths

INTRODUCTION

Soil-transmitted helminths (STH) such as roundworms (Ascaris lumbricoides), whipworms (Trichuris trichiura) and hookworms affects more than 2 billion people worldwide [1]. Specifcially, about 1 billion people are infected with roundworms, 740 million people are infected with hookworms and 795 million people are infected with whipworms [1]. According to Belizario et al. [2], the cumulative prevalence, which is the positivity for at least one type of STH infection, among elementary school children in the Philippines was 67%. The highest rates of heavy cases of soil- transmitted helminths infections were from Cavite (22%) and Nueva Ecija (11.3%).

STH Infections spread through hand to mouth manner or through consumption of contaminated food and water. It is common in areas where living conditions is poor and the temperature is high and in rural developing regions mainly among children, since they actively play in the environment. It mainly causes diarrhea and stomach pain but can also cause growth deficiency and can impair cognitive development once not treated immediately and becomes chronic especially in children [3].

Personal hygiene and missing hygienic equipment such as toilet and water also contributes to the acquisition of soil helminths diseases. Also, water supply of both animals and human as either for washing, drinking and living condition falls under environmental health factor that contribute to the transmission and infection of soil transmitted helminths. Other factors include socioeconomic status of the person, demography of the area, health related behavior and knowledge about the transmission processes and basic information about soil transmitted helminths.

This study aimed to assess the presence of soil transmitted helminthes among children aged 3-8 years in a selected Barangay in Trece Martires City, Cavite and determine its association with the family's demographic profile (parents' highest educational attainment, children's age and gender) and transmission factors (family size, house flooring, water sources, presence of latrine, hand washing habit and shoe-wearing habit).

METHODOLOGY

1. Study Design and Setting

A descriptive cross-sectional study was conducted in a selected Barangay in Trece Martires City, Cavite in the period of February to April 2017. Total population sampling was done among children aged 3 to 8 years' old who lived in the chosen barangay. The total number of children was 132, of which 108 was included while 24 of them did not submit their stool samples.

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2. Data Collection and Specimen Analysis

Prior to data collection, assent from the parents of the children were obtained. Then, the children were screen using a questionnaire to determine the demographic data which includes (parents' highest educational attainment, children's age and sex and risk for transmission factors which includes family size, house flooring, water sources, presence of latrine, hand washing habit and shoe-wearing habits. After the screening was done, specimen bottles were given to the parents with set of instructions on how to collect the stool.

Stool specimen was collected from each subjects using a pre-labeled specimen bottles and was examined using Kato thick technique by a registered medical technologist.

3. Statistical Analysis

Data collected were analyzed using descriptive statistics such as frequency and percentage to describe the presence of STH infection while spearman rank correlation was used for bivariate analysis using IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.

RESULTS

1. Demographic data and transmission factors of the subjects

Table 1 shows the demographic data and transmission factors of STH infection among school age children. The mean age of the subjects was 5.13 years old with the youngest subject being 2 years old and the oldest being 10 years old. The subjects were dominated by girls with most of their parents being high school graduate.

Most of the family of the children have 3 to 4 members (62%) and uses water from faucet as the main source of drinking water (77.8%). The children mostly observed proper hand washing habits (98.1%), wears slippers inside the house (90.7%), however, most of the children do not wear slippers outside the house (53.7%). The typical flooring of the house is cemented (84.2%) and has presence of latrine (83.3%).

2 Prevalence and proportion of STH infection

The presence of soil-transmitted helminthes infection with Ascaris lumbricoides, Trichuris trichuria and hookworm among the subjects were identified using Kato thick method. The prevalence of STH infection was 37.04%. Table 2 shows the proportion of STH infection found in stool Soil transmitted helminthiases (STH) have long been neglected by donor agencies as they are perceived to have a very low burden of disease index. However, more than a third of the world's population are currrently infected and children suffer from profound physical deficits such as anemia, malnutrition, stunted growth and cognitive delays [4-9].

In the Philippines, STH's are still a major public health problem particularly among school-aged children. A nationwide survey performed over a period of 10 years found the prevalence in children aged 2-14 years to be 50-90%. Furthermore, up to 30% of the 22 million children in the Philippines were infected with more than one STH species [10-11]. The Philippines Integrated Helminth Control Program has been in place since 2006 and has

examination of school age children where proportion of Ascaris lumbricoides infection was 8.33%, Trichuris trichiura infection was 2.78%, Hookwrm infection was 0.93% and mixed infection of 25%

3. Association of STH infection and transmission factors among school age children

Table 3 shows the multiple logistic regression test conducted to determine the association of STH infection and transmission factors among school age children. Based on the results, educational attainment (OR: 0.002, 95% CI: 1.528-6.132) was found to be a risk factor for transmission of STH.

Discussion

provisions for mass targeted and selective deworming. As indicated by the maps of predicted STH infection prevalence, there remain numerous areas that still have a high prevalence of STH infections. Hence, this study was conducted to determine risk factors that could be targeted for modification to significantly bring down STH prevalence in the country.

In the present study, it was found that up to 37.04% of participants were infected with any soil transmitted helminths occuring mostly in children aged 3-6 years accounting to 80% of the prevalence rate. This is considerably lower than the prevalence rate obtained among school children in Negros Occidental (67.4%), Quezon City (51.6%), Nueva Ecija (70%), Western Visayas (>70%) and Bataan (73-77%) [12]. A plausibe explanation could be by

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the use of Kato-Katz smear in this study. We decided to employ Kato-Katz because this method is predominantly used in STH prevalence study in the Philippines and thus allow comparison with other small-scale studies. While kato-katz remains the cheapest and often the only available method in the field, its lack of sensitivity is one of its disadvantage [13]. The low sensitivity of Kato-Katz has been particularly prominent in low infection intensities and due to day-to-day variation in egg output of the adult worms [14]. Variations in socioeconomic and sanitation status, local endemicity, climatic and geographical conditions of the study sites and the research design are also some of the plausible factors explaining the differences in the prevalence rates of these helminth infections [15].

Table 1. Demographic data and transmission factors of the school age children

Variables	n	%
Age (years)		
3-4	46	42.6
5-6	35	32.4
7-8	27	25
Sex		
Male	52	48.1
Female	56	51.9
Educational attainment		
College	23	21.3
High school	58	53.7
Elementary	27	25.0
Family size		
3-4	67	62
5-6	29	26.9
7-8	12	11.1
Water source		
Faucet	84	77.8
Mineral Water	24	22.2
Hand washing habits		
Yes	106	98.1
No	2	1.9
Shoe wearing (outside)		
Yes	98	90.7
No	10	9.3
Shoe wearing outside (inside)		
Yes	50	46.3
No	58	53.7
House Flooring		
Soil	17	15.7
Cemented	91	84.2
Presence of latrine		
Yes	90	83.3
No	18	16.7

Table 2. Prevalence and proportion of STH infection

Prevalence of STH infection	n	%
STH infection		
Positive	40	37.04
Negative	68	62.96
Type of worm		
Ascaris lumbricoides	9	8.33
Trichuris trichiura	3	2.78
Hookworm	1	0.93
Mixed infection	27	25
None	68	62.96

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Table 3. Association of STH infection and transmission factors among school age children

Variables	STH infection		*p*	*OR*	95% CI
	Positive	Negative			
	n (%)	n (%)			
Age (years)					
3-4	16 (34.8)	30 (65.2)			
5-6	16 (45.7)	19 (54.3)	0.349	0.762	0.431-1.346
7-8	8 (29.6)	19 (70.4)			
Sex					
Male	20 (38.5)	32 (61.5)	0.830	0.904	0.358-2.282
Female	20 (35.7)	36 (64.3)			
Educational attainment					
College	5 (21.7)	18 (78.3)			
Highschool	17 (29.3)	41 (70.7)	*0.002	3.061	1.528-6.132
Elementary	18 (66.7)	9 (33.3)			
Family size					
3-4	24 (35.8)	43 (64.2)			
5-6	12 (41.4)	17 (58.6)	0.862	1.060	0.548-2.050
7-8	4 (33.3)	8 (66.7)			
Water source					
Faucet	27 (32.1)	57 (67.9)	0.071	2.747	0.916-8.245
Mineral Water	13 (54.2)	11 (45.8)			
Hand washing habits					
Yes	38 (35.8)	68 (64.2)	-	-	-
No	2 (100)	0 (0)			
Shoe wearing (outside)					
Yes	34 (34.7)	64 (65.3)	0.154	3.161	0.649-15.399
No	6 (60)	4 (40)			
Shoe wearing (inside)					
Yes	17 (34)	33 (66)	0.996	0.998	0.405-2.458
No	23 (39.7)	35 (60.3)			
House Flooring					
Soil	4 (23.5)	13 (76.5)	0.277	2.093	0.553-7.916
Cemented	35 (38.9)	55 (61.1)			
Presence of latrine					
Yes	34 (37.8)	56 (62.2)	0.855	0.897	0.280-2.873
No	6 (33.3)	12 (66.7)			

CI=Confidence Interval
Significant association=<0.05

The finding that Ascaris lumbricoides and Trichuris trichiuria were the most commonly found helminthsis consistent with previous studies [16-17]. The results are consistent with the known ubiquity of A. lumbricoides and T. trichiuria infections in the Philippines and the similar mode of transmission of the two species, i.e, the ingestion of embryonated eggs. Similar findings were also obtained among pupils in Northeast Ethiopia where Trichuris and Ascaris, along with Schistosoma were mostly detected [18].

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The finding that A. lumbricoides and T. trichiuria infections are more prevalent in individuals aged 3-6 years is consistent with the known epidemiology of these infection. Previous studies show that the relationship between age and prevalence of Ascaris and Trichuris infections are characteristically convex in shape with the highest intensities observed in school-aged children [19]. Multifactorial risk factor analysis showed age to be a significant risk factor for the prevalence of Ascaris with prevalence decreasing by a factor of 1.02 for every year of life [20]. This is likely related to behaviour (playing in the soil and possibly unsatisfactory hygiene habits) that leads to exposure to the parasites infective stages.

The study revealed that sex does not have any significant association with helminth infection which agrees with the findings in the STH infection in school children in South-Eastern Nigeria [21] but contradicts with the intestinal helminthiasis among school children in Southwest Nigeria where the proportions of infected male and female pupils significantly vary. However, it is not yet established if helminth infection is sex-dependent [22] or not [21] as some studies claimed that it is sex-dependent while some suggest otherwise [23]. It is more evident however that STH is associated with occupational exposure [17] and that A. lumbricoides infection intensity was influenced by age-related behavioral and environmental factors that contribute to exposure [24].

Most of the participants has a family size of 3-4 members and in contrast with other study there is no sufficient evidence to conclude that there is association of family size to STH infection. Household crowding i.e, individuals living in households with more than six members were 2.0 times more likely to be infected with Ascaris (95% CI:2,0 3.3 p=0.0041), 1.6 times more likely to be infected with Trichuris (p=0.0561) and 1.7 times more likely to be infected with hookworms (95% CI: 1.0, 2.7 p=0.0338) than individuals living in households with six or fewer members [20].

Compared with uninfected individuals, participants of this study with any STH infection were more likely to have parents with elementary education as the highest educational attainment. (OR. 3.061 95% CI: 1.5, 6.1 p =0.002). This is in agreement with the findings of Traub et al. [20] and Smith [25]. After adjusting for other variables, individuals were 1.3 times less likely to be infected with Ascaris (p=0.0581), 1.4 times less likely to be infected with hookworm (p=0.0093) with increasing levels of education. When other variables were taken into consideration an individual's level of education remained a strong predictor for the intensities for all geohelminths [20]. An individual's education level or in the case of a child, maternal education, has been found to one of the most important risk factors for parasitism in numerous studies [26-27].
It appears that children from lower socioeconomic status were more likely to have STH infection as educational attainment, large family size which showed higher prevalence of infection are correlated with socioeconomic status.

There is a higher prevalence of infection in participants whose source of drinking water is from the tap as compared with bottled water. An explanation for this is that tap water is contaminated because of leaking or very old pipes. In contrast, bottled water is purified and has passed quality standards that make it safe for drinking. However, it is not associated with a higher odds of infection. Many studies reported that poor access to water and sanitation are risk factors for STH infection [28-29], however, the evidence on this association remains limited and needs further study.

Given that STH's are intimately associated with poverty and poor hygienic practices, it is crucial that these factors addressed effectively. For control to be both effective and sustainable, it is necessary to adopt an integrated approach. Non-chemotherapeutic based options such as health education which aim to modify risk factors and behaviors that increases exposure and transmission must be integrated in STH control programs

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